



ORIGINAL ARTICLE

## Portuguese Children's Sleep Habits Questionnaire - validation and cross-cultural comparison<sup>☆</sup>

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### PALAVRAS-CHAVE

Sono;  
Questionário;  
Português;  
Criança;  
Validade;

### Abstract

**Objective:** to validate the Portuguese version of the Children's Sleep Habits Questionnaire (CSHQ-PT) and compare it to the versions from other countries.

**Methods:** the questionnaire was previously adapted to the Portuguese language according to international guidelines. 500 questionnaires were delivered to the parents of a Portuguese community sample of children aged 2 to 10 years old. 370 (74%) valid questionnaires were obtained, 55 children met exclusion criteria and 315 entered in the validation study.

**Results:** the CSHQ-PT internal consistency (Cronbach's  $\alpha$ ) was 0.78 for the total scale and ranged from 0.44 to 0.74 for subscales. The test-retest reliability for subscales (Pearson's correlations,  $n=58$ ) ranged from 0.59 to 0.85. Our data did not adjust to the original 8 domains structure in Confirmatory Factor Analysis but the Exploratory Factor Analysis extracted 5 factors that have correspondence to CSHQ subscales.

**Conclusion:** the CSHQ-PT evidenced psychometric properties that are comparable to the versions from other countries and adequate for the screening of sleep disturbances in children from 2 to 10 years old.

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### Questionário de Hábitos de Sono das Crianças em Português – validação e comparação transcultural

### Resumo

**Objetivo:** validar a versão em português do Questionário de Hábitos de Sono das Crianças (CSHQ-PT) e compará-la às versões de outros países.

**Métodos:** o questionário foi anteriormente adaptado para o português de acordo com as diretrizes internacionais. 500 questionários foram entregues aos pais de uma amostra populacional

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### Confiabilidade; Comparação transcultural

portuguesa de crianças com idade entre 2 e 10 anos. 370 (74%) questionários válidos foram obtidos, 55 crianças apresentaram critérios de exclusão e 315 foram aceitas no estudo de validação.

**Resultados:** a consistência interna do CSHQ-PT ( $\alpha$  de Cronbach) foi de 0,78 para a escala completa e variou de 0,44 a 0,74 nas subescalas. A confiabilidade teste-reteste das subescalas (correlações de Pearson,  $n = 58$ ) variou de 0,59 a 0,85. Nossos dados não foram compatíveis com a estrutura original de 8 domínios na Análise Fatorial Confirmatória, porém a Análise Fatorial Exploratória extraiu 5 fatores que correspondem às subescalas do CSHQ.

**Conclusão:** o CSHQ-PT apresentou propriedades psicométricas comparáveis às versões de outros países e adequadas para triagem de problemas do sono em crianças de 2 a 10 anos de idade.

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## Introduction

Adequate sleep is increasingly recognized as an important determinant of child and adolescent health, for inadequate sleep may impact daytime cognitive functions, academic performance, behavior, emotional regulation, weight and the risk of accidental falls.<sup>1-5</sup> Its consequences may extend also to the parents sleep quality and daytime functioning.<sup>6</sup>

Parents report sleep difficulties in 10-75% of children worldwide, ranging from transient benign behavioral problems to more persistent and severe conditions such as the sleep apnea syndromes.<sup>3,7,8</sup> Sleep problems also seem to be common in Portugal and in Brazil, but there is a lack of recent data about the sleep habits of children aged 2 to 6 years old obtained with validated questionnaires.<sup>9,10</sup>

The Children's Sleep Habits Questionnaire (CSHQ) is a retrospective parent-report questionnaire that was developed in the United States to evaluate the sleep behavior in school-aged children.<sup>11</sup> The questions were selected in order to include the symptom presentations of the most common pediatric sleep disorders, according to the International Classification of Sleep Disorders.<sup>12</sup> Thirty-three out of its 45 initial items (Fig. 1) were further conceptually grouped into eight subscales, reflecting the following sleep domains: Bedtime Resistance, Sleep Onset Delay, Sleep Duration, Sleep Anxiety, Night Wakings, Parasomnias, Sleep-Disordered Breathing and Daytime Sleepiness. This 33-items structure was validated for the screening sleep disturbances in school-aged children (4 to 10 years old) showing a full scale internal consistency of 0.68 in a community sample, ranging from 0.36 to 0.70 for the subscales. Comparing the results from community and clinic samples, this study suggested a total score cut off of 41 to identify children with potential sleep disorders.<sup>12</sup>

The CSHQ was subsequently used in several studies, reflecting its usefulness and adequate psychometric properties, and it was also successfully used with children aged 2 to 3 years old.<sup>13,14</sup> There are adaptations of the questionnaire to other languages such as Chinese, Hebrew, Dutch, German, Italian and Spanish and, for most of them, there are published validation studies.<sup>15-20</sup>

The CSHQ was previously adapted to the Portuguese language and culture.<sup>21</sup> In this study we aimed to perform its validation and to compare it to the versions from other countries.

## Methods

The CSHQ evaluates the parents' perception of their child's sleep during the last week or, if it was not representative for some reason, during a recent more typical week. The frequency of sleep related behaviors is rated on a 3-point scale as "usually" (5 to 7 times per week, scored as 3 points), "sometimes" (2 to 4 times per week, scored as 2 points) or "rarely" (0 to 1 time per week, scored as 1 point). The scoring of some items was reversed (items 1, 2, 3, 10, 11 and 26) so that an higher score corresponds to a more disturbed sleep. Full scale (33 items) and subscales scores can be calculated.<sup>12</sup> The subscales are Bedtime Resistance (items 1, 3, 4, 5, 6 and 8), Sleep Onset Delay (item 2), Sleep Duration (items 9, 10 and 11), Sleep Anxiety (items 5, 7, 8 and 21), Night Wakings (items 16, 24 and 25), Parasomnias (items 12, 13, 14, 15, 17, 22 and 23), Sleep-Disordered Breathing (items 18, 19 and 20) and Daytime Sleepiness (items 26, 27, 28, 29, 30, 31, 32 and 33).

The cultural adaptation of the CSHQ to the Portuguese language (CSHQ-PT) was authorized by the author of the original version in 2009, who also approved the final back translation. This process was developed by a translation team from Portugal, according to recommended guidelines.<sup>21,22,23</sup> The questionnaire was translated to the Portuguese language by two independent translators and a single consensus version was obtained; the English back translation was performed by another two translators who had English as their first language, and synthesized in a single version. The translation team, that also included a respiratory medicine pediatrician and a professional translator, reviewed the documents in order to solve the small discrepancies and to get a Portuguese version that was conceptually equivalent to the original and understandable for parents with low literacy level. The final Portuguese version (Fig. 2) was tested in cognitive interviews ( $n=10$  parents, including 3 with Brazilian Portuguese as their first language) showing that it was clear for all of them.

For children under 4 years, the item "Wets bed" did not apply and it was scored as "sometimes" as in a previous study with this age band.<sup>13</sup>

The participants were enrolled in schools ( $N=252$ ) and also in surveillance appointments ( $n=248$ ), so that younger children would be included. In order to have a more representative sample, both medium-high and low population

**Bedtime**

Write in child's bedtime: \_\_\_\_\_

	3 Usually (5-7)	2 Sometimes (2-4)	1 Rarely (0-1)
Child goes to bed at the same time at night (R) (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child falls asleep within 20 minutes after going to bed (R) (2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child falls asleep alone in own bed (R) (3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child falls asleep in parent's or sibling's bed (4)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child needs parent in the room to fall asleep (5)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child struggles at bedtime (cries, refuses to stay in bed, etc.) (6)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child is afraid of sleeping in the dark (7)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child is afraid of sleep alone (8)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Sleep Behavior**Child's usual amount of sleep each day: \_\_\_\_\_ hours and \_\_\_\_\_ minutes  
(combining nighttime sleep and naps)

Child sleeps too little (9)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child sleeps the right amount (R) (10)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child sleeps about the same amount each day (R) (11)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child wets the bed at night (12)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child talks during sleep (13)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child is restless and moves a lot during sleep (14)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child sleepwalks during the night (15)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child moves to someone else's bed during the night (parent, brother, sister, etc.) (16)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child grinds teeth during sleep (your dentist may have told you this) (17)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child snores loudly (18)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child seems to stop breathing during sleep (19)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child snorts and/or gasps during sleep (20)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child has trouble sleeping away from home (visiting relatives, vacation) (21)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child awakens during night screaming, sweating, and inconsolable (22)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child awakens alarmed by a frightening dream (23)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Waking During the Night**

Child awakes once during the night (24)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child awakes more than once during the night (25)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Morning Waking**

Write in the time of day child usually wakes in the morning: \_\_\_\_\_

Child wakes up by him/herself (26) (R)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child wakes up in negative mood (27)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adults or siblings wake up child (28)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child has difficulty getting out of bed in the morning (29)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Child takes a long time to become alert in the morning (30)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Daytime Sleepiness**

Child seems tired (31)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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During the past week, your child has appeared very sleepy or fallen asleep during the following  
(check all that apply):

	1 Not Sleepy	2 Very Sleepy	3 Falls Asleep
Watching TV (32)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Riding in car (33)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Figure 1** The original Children's Sleep Habits Questionnaire (33-item version).

HORA DE DEITAR		pontuação: (3) (2) (1)		
Durante a semana: ____ horas e ____ minutos		No fim de semana: ____ horas e ____ minutos		
A criança...		Habitualmente (5 a 7 vezes por semana)	Às vezes (2 a 4 vezes por semana)	Raramente (uma vez ou nunca)
Deita-se sempre à mesma hora (R)(1)		( )	( )	( )
Depois de se deitar, demora até 20 minutos a adormecer (R)(2)		( )	( )	( )
Adormece sozinha na sua própria cama (R)(3)		( )	( )	( )
Adormece na cama dos pais ou dos irmãos (4)		( )	( )	( )
Precisa de um dos pais no quarto para adormecer (5)		( )	( )	( )
"Luta" na hora de deitar (chora, recusa-se a ficar na cama, etc.)(6)		( )	( )	( )
Tem medo de dormir no escuro (7)		( )	( )	( )
Tem medo de dormir sozinha (8)		( )	( )	( )
<b>COMPORTAMENTO DURANTE O SONO</b>				
Tempo total de sono diário: ____ horas e ____ minutos (considerando o sono da noite e as sestas)				
A criança...		Habitualmente (5-7 vezes)	Às vezes (2-4 vezes)	Raramente (0-1 vez)
Dorme pouco (9)		( )	( )	( )
Dorme o que é necessário (R)(10)		( )	( )	( )
Dorme o mesmo número de horas todos os dias (R)(11)		( )	( )	( )
Molha a cama à noite (crianças com 4 ou mais anos) (12)		( )	( )	( )
Fala a dormir (13)		( )	( )	( )
Tem sono agitado, mexe-se muito a dormir (14)		( )	( )	( )
Anda a dormir, à noite (sonambulismo) (15)		( )	( )	( )
Vai para a cama dos pais, irmãos, etc., a meio da noite (16)		( )	( )	( )
Range os dentes durante o sono (17)		( )	( )	( )
Ressona alto (18)		( )	( )	( )
Parece parar de respirar durante o sono (19)		( )	( )	( )
Ronca ou tem dificuldade em respirar durante o sono (20)		( )	( )	( )
Tem dificuldade em dormir fora de casa (na casa de familiares, nas férias, etc.) (21)		( )	( )	( )
Acorda durante a noite a gritar, a suar, inconsolável (22)		( )	( )	( )
Acorda assustada com pesadelos (23)		( )	( )	( )
<b>ACORDAR DURANTE A NOITE</b>				
Acorda uma vez durante a noite (24)		( )	( )	( )
Acorda mais de uma vez durante a noite (25)		( )	( )	( )
<b>ACORDAR DE MANHÃ</b>				
Hora de acordar nos dias de semana: ____ horas e ____ minutos		no fim de semana: ____ horas e ____ minutos		
A criança...		Habitualmente (5-7 vezes)	Às vezes (2-4 vezes)	Raramente (0-1 vez)
De manhã, acorda por si própria (R)(26)		( )	( )	( )
Acorda mal-humorada (27)		( )	( )	( )
De manhã, é acordada pelos pais ou irmãos (28)		( )	( )	( )
Tem dificuldade em sair da cama de manhã (29)		( )	( )	( )
Demora a ficar bem acordada (30)		( )	( )	( )
<b>SONOLÊNCIA DURANTE O DIA</b>				
Parece cansada (31)		( )	( )	( )
Na semana passada, a criança pareceu sonolenta em alguma destas situações?		Não ficou sonolenta (1)	Ficou muito sonolenta (2)	Adormeceu (3)
A ver televisão (32)		( )	( )	( )
A andar de carro (33)		( )	( )	( )

Figure 2 Portuguese version of the Children's Sleep Habits Questionnaire (33-item version).

density regions of Portugal were selected. Parents who volunteered received a second questionnaire for retest analysis after 1-2 weeks (n=138).

The minimum sample size was set as N=231 for an estimated full scale  $\alpha=0.70$  to be determined with a 95% confidence interval of  $\pm 0.05$ .<sup>24</sup> This sample size would also be reasonable for factor analysis.<sup>25</sup> Allowing for non-responders and children with exclusion criteria, 500

questionnaires were delivered to a convenience sample of parents of children from 2 to 10 years old.

The inclusion criteria were eligible age of the children and the willingness of the parents to participate after informed consent. As in the original validation study, the exclusion criteria were the parent report of a developmental or psychiatric disorder (such as Attention Deficit Hyperactivity Disorder - ADHD, Autism Spectrum Disorder)

or medication (psychostimulants, anticonvulsants or antihistamines) that might impact sleep.<sup>12</sup>

In the absence of a well established socioeconomic status classification in Portugal, the parent educational level was used for this characterization.

The study protocol and the questionnaire were approved by the Ministry of Education and the Ethics Committee. The questionnaires were delivered between October 2010 (pilot study) and February 2011.

The data analysis was made with SPSS 11.0 program, except for Confirmatory Factor Analysis that was performed using LISREL 8.7 software. P values were considered significant if under 0.05. Unpaired t test, Kruskal-Wallis tests and chi-square tests were used to compare means, distributions and proportions between groups as appropriate.

The internal consistency of the 33 scoring items and its subscales was assessed with Cronbach's  $\alpha$  coefficients. Test-retest reliability for subscales was evaluated with Pearson's r. The correlations were regarded as weak (0.20-0.39), moderate (0.40-0.59), strong (0.60-0.79) or very strong (0.80-1.00).<sup>26</sup>

Confirmatory Factor Analysis was performed to test the adjustment of our data to the 8-factor model of the original CSHQ. A Comparative Fit Index (CFI) > 0.95 and a Root Mean Square Error of Approximation (RMSEA) < 0.06 were considered as a good fit.<sup>27</sup> As these conditions were not satisfied, we performed also an Exploratory Factor Analysis.

## Results

Three hundred and seventy seven questionnaires were returned and seven were excluded for having more than 20% missing or invalid answers. From 370 (74%) valid questionnaires, fifty five children (15%) met exclusion, 29 for disease (mainly ADHD) and 30 for medication (mainly antihistamines). Likewise, 315 questionnaires entered in the validation study.

The questionnaires were answered by the mothers (81.9%), fathers (12.3%), both (4.8%) or other person (1.0%). The children's mean age was  $5.8 \pm 2.4$  years. Other Socio-demographic characteristics are presented in Table 1.

The CSHQ-PT total score mean was  $47.0 \pm 7.2$  (95% CI: 46.10-47.81). Comparing the mean total scores from three age subgroups (2 to 4, 5 to 7, and 8 to 10 years), we found a trend for a gradual decrease:  $49.4 \pm 7.8$ ,  $46.2 \pm 6.1$ ,  $45.11 \pm 7.1$ , respectively ( $p < 0.001$ ). There were no differences between boys and girls. Children identified by the parents as "Problem sleepers" had a higher mean score than "Non-problem sleepers": 54.5 versus 45.9, respectively ( $p < 0.001$ ).

The internal consistency of the CSHQ-PT was 0.78 for the full 33-item scale (95% CI 0.746 - 0.809) and ranged from 0.44 to 0.74 for the subscales (Table 2). Eliminating items 21, 26, 28, 32 and 33 would increase the total scale  $\alpha$  to 0.81 but would decrease the subscales  $\alpha$ , except for item 21. Eliminating items 7 and 21 would increase Sleep Anxiety  $\alpha$  from 0.44 to 0.57.

The answers for children aged 2 to 3 years old ( $n = 68$ ) showed internal consistencies that were similar to the older ones: total scale 0.78, Bedtime Resistance 0.74, Sleep Duration 0.72, Sleep Anxiety 0.53, Night Wakings 0.58,

**Table 1** Socio-demographic characterization of the validation sample ( $n = 315$ ).

Variable	n	%
<i>Child gender</i>		
Male	149	47.3%
Female	166	52.7%
<i>Child age</i>		
2 years old	37	11.7%
3 y.o.	31	9.8%
4 y.o.	43	13.7%
5 y.o.	33	10.5%
6 y.o.	34	10.8%
7 y.o.	45	14.3%
8 y.o.	49	15.6%
9 y.o.	34	10.8%
10 y.o.	9	2.9%
<i>Parent education</i>		
I. Less than 9 years	24	7.6%
II. 9 years	65	20.6%
III. 12 years	96	30.5%
IV. Bachelor's degree or higher	118	37.5%
Missing	12	3.8%
<i>Population density zone</i>		
Medium-High (urban $\geq 100/\text{Km}^2$ )	225	72.6%
Low (rural, $<100/\text{Km}^2$ )	85	27.4%
<i>Country of residence</i>		
Portugal	315	100%

Parasomnias 0.57, Sleep-Disordered Breathing 0.74 and Daytime Sleepiness 0.64.

Retest questionnaires were sent to 138 parents with a 57.2% response rate. Twenty one questionnaires presented exclusion criteria and 58 were used in test-retest reliability analysis. The total CSHQ score showed a strong correlation in retests (0.79,  $p < 0.001$ ). Subscale score correlations ranged from 0.59 to 0.85 (Table 3). The sleep schedules (bedtime and wake time in weekdays and weekends) showed very strong correlations (from 0.86 to 0.96) except for the bedtime in the weekend (0.64,  $p < 0.001$ ). The child's usual amount of sleep each day also showed a strong correlation in retests ( $r=0.79$ ,  $p < 0.001$ ).

Our data did not fit the original CSHQ eight domain structure in Confirmatory Factor Analysis as CFI was 0.863 and RMSEA was 0.063. The Exploratory Factor Analysis extracted five factors: daytime somnolence (items 26, 27, 28, 29, 30 and 31), difficulty in settle to sleep alone/sleep anxiety (items 3, 4, 5, 8 and 16), night wakings and parasomnias (items 12, 13, 14, 22, 23, 24 and 25), sleep duration (items 1, 2, 6, 9, 10, 11 and 25) and Sleep-disordered breathing (items 18, 19 and 20).

## Discussion

The CSHQ has already been used for children aged 2 to 3 years but the validation data for this age band is scarce.<sup>28</sup> In this study, we found total scale and subscale internal consistencies that were similar to older children.<sup>12,17,18</sup>



**Table 2** CSHQ internal consistencies (Cronbach's  $\alpha$ ) in community samples from different countries.

	Portugal	US <sup>12</sup>	China <sup>15</sup>	Israel <sup>16</sup>	Netherlands <sup>17</sup>	Germany <sup>18</sup>
Full scale	0.78 <sup>a</sup>	0.68	0.80	0.81	NP	0.68
Subscales:			0.49-0.72			
<i>Bedtime resistance</i>	0.74 <sup>a</sup>	0.70		0.78	0.68	0.70
<i>Sleep duration</i>	0.68 <sup>a</sup>	0.69		0.68	0.63	0.70
<i>Sleep anxiety</i>	0.44 <sup>a</sup>	0.63		0.65	0.54	0.55
<i>Night wakings</i>	0.58 <sup>a</sup>	0.54		0.49	0.62	0.49
<i>Parasomnias</i>	0.57 <sup>a</sup>	0.36		0.28	0.54	0.36
<i>Sleep-disordered breathing</i>	0.67 <sup>a</sup>	0.51		0.46	0.47	0.23
<i>Daytime sleepiness</i>	0.71 <sup>a</sup>	0.65		0.67	0.67	0.63
Study sample size	315	469	517	98	1145	298

CSHQ, Children's Sleep Habits Questionnaire; NP, not published.

<sup>a</sup>  $p < 0.001$ .

Considering the full sample, the total scale  $\alpha$  (0.78) is above the recommended value of 0.70.<sup>24</sup> It is also higher than the values described in community samples from the United States and Germany (Table 2) and identical to an US clinical sample.<sup>12,18</sup> The CSHQ-PT also evidenced convergent validity with the overall parent evaluation of sleep difficulties as children identified as "Problem sleepers" got higher total scores.<sup>24</sup>

Subscale internal consistencies were similar to the original validation values (see Table 2), except for the lower  $\alpha$  for the Sleep Anxiety subscale (0.44). This has already been described in the Dutch and German questionnaires and the same was found for other scales in other languages.<sup>12,16-18</sup> In Portugal, it seems that items 7 and 21 are not well adapted to our reality because eliminating them would increase the subscale  $\alpha$  to 0.57. Besides that, Factorial Analysis showed that items 3 and 4 were also related to this construct.

Factor analysis (FA) is not described in the original CSHQ validation study.<sup>12</sup> We found that our data did not show a good fit to the original subscales in Confirmatory FA but the Exploratory FA extracted 5 factors with an interesting correspondence to the subscale domains. The Dutch community sample did not fit either and 4 factors were determined as in a smaller study with English-speaking children.<sup>17,28</sup> These differences may be related to the translation process as well as distinct patterns of sleep behaviors in the studied

populations. This is the reason why, despite all the effort involved in the cross-cultural adaptation of questionnaires, the validation of the new versions is mandatory.<sup>22,23</sup> Nevertheless, it is appropriate to keep the original CSHQ items and subscales for Portuguese children for they showed acceptable psychometric properties and they are important for both clinical purposes and cross-cultural comparisons.

The test-retest reliability analysis for subscales showed strong and very strong correlations that were similar or higher than the original ones and comparable to the intraclass correlation coefficients from other studies (Table 3). We also present for the first time test-retest correlations for the sleep schedules and the quantitative sleep duration evaluation of the CSHQ, finding that most of them are above the recommended value of 0.70.<sup>24</sup>

The mean total CSHQ score in Portuguese children was higher than described before in North American, Chinese, Dutch, German and Hebrew community samples, even when considering only 4-10 years old (mean total score  $46.45 \pm 7.14$ ).<sup>14-18</sup> This finding suggested an higher prevalence of problematic sleep behaviors in our population that needs further investigation.

We present the validation of an international instrument that may be useful for both clinical practice and research. Since the beginning of this project, other children sleep questionnaires were adapted to the Portuguese language in

**Table 3** CSHQ test-retest reliability in community samples from different countries.

Subscales	Test-retest reliability Portugal (Pearson's $r$ ) <sup>a</sup>	United States <sup>12</sup> (Pearson's $r$ )	Netherlands <sup>17</sup> (ICC)	Germany <sup>18</sup> (ICC)
Bedtime resistance	0.85 <sup>b</sup>	0.68	0.83	0.74
Sleep onset delay	0.59 <sup>b</sup>	0.62	0.65	0.72
Sleep duration	0.67 <sup>b</sup>	0.40	0.47	0.46
Sleep anxiety	0.82 <sup>b</sup>	0.79	0.93	0.73
Night wakings	0.80 <sup>b</sup>	0.63	0.79	0.68
Parasomnias	0.79 <sup>b</sup>	0.62	0.73	0.67
SDB	0.82 <sup>b</sup>	0.69	0.72	0.63
Daytime sleepiness	0.69 <sup>b</sup>	0.65	0.79	0.81

CSHQ, Children's Sleep Habits Questionnaire; ICC, Intraclass correlation coefficients; SDB, Sleep-disordered breathing.

<sup>a</sup> Pearson's correlation except for Sleep onset delay (1-item subscale, Spearman's correlation).<sup>b</sup>  $p < 0.001$ .

Brazil, having less emphasis in the behavioral dimension of sleep and different age limits.<sup>29,30</sup> The adaptation of the CSHQ to the Portuguese language included cognitive interviews with Brazilian parents living in Portugal and showed that the questionnaire was clear to all of them. Therefore, although it was not yet validated in Brazil, the CSHQ-PT also seems adequate for Brazilian populations.<sup>21</sup>

We do recognize some limitations in our work. We used convenience samples that, although heterogeneous in geographic and socioeconomic characteristics, may not be fully representative of the Portuguese population. Also, we were not able to characterize non responders due to privacy constraints, though we got a fair response rate (74%) comparing to other countries (46.9% in the USA, 63% in Holland and 92% in China).<sup>12,15,17</sup> The comparison of the CSHQ-PT results with sleep logs and more objective actigraphy data would also be useful.

In conclusion, our study shows that the CSHQ-PT is comparable to the versions from other countries and has adequate psychometric properties for the screening of sleep problems in children aged from 2 to 10 years old.

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## Conflicts of interest

The authors declare no conflicts of interest.

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